

## ABSTRACT OF THE DISCLOSURE

A detector uses the magneto-optical Kerr effect and exploits the transition region between two magnetization states of a magneto-optical film to detect magnetic fields of less than 100 pT. The magnetic field of a subject is determined by examining the polarization of light reflected from the magneto-optical film. A several  $\mu\text{m}$  thick, bismuth doped, YIG film is used for detection as the transition regions are steep, providing large changes in the polarization rotation angle for small variations in the applied magnetic field. The apparatus may be used in the functional imaging of various organs and systems in humans and animals or for the spatial and temporal tracking of nano or micro magnetic particles intentionally introduced into the circulatory or intestinal systems for diagnostic or research purposes.